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Study on voluntary arrangements for collaboration in
construction

[Contract No SI2.ICNPROCE015827500]

Draft Final Report

Part 2: Best Practice Guide and Case Studies

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Building Together - a Guide to Successful Collaboration in Construction

PART 1 – GUIDANCE

January 2009

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FOREWORD

[The Study Team suggests that the Guide might have a Foreword signed by a senior representative of the Commission (perhaps the Commissioner responsible for DG ENTR) which would reiterate the benefits of voluntary arrangements and their contribution to European competitiveness, and commend the Guide to readers.]

Disclaimer

It has been suggested that the Guide should carry a disclaimer, along the lines of:

"Users of this Guide should note that neither the authors nor the European Commission can be held liable for any loss, damage or expense arising from the use of the guidance in this document."

This might appear on the inside front cover.

1 INTRODUCTION

Background

- 1.1 In every EU Member State, the construction sector is large and highly diverse. Even small construction projects call on a range of skills – design, masonry, carpentry, electrical, etc – while large projects may involve hundreds or even thousands of supply firms. Each of these inputs has to be managed, and co-ordinated with the others. In every country, therefore, there are well understood structures of responsibility, typically set out in legal and contractual documents, which govern how these many different inputs are provided.
- 1.2 Many projects are delivered successfully through everyone working together in harmony within these structures; the individuals and firms involved in the project agree work programmes and jointly develop solutions to the issues that inevitably arise once construction commences on site. Sometimes, however, disputes occur, relationships deteriorate, and projects over-run. When this happens, it is bad for the client who does not have delivery of the final output – the building, road, bridge etc – when they expect; bad for the intended users who cannot benefit from that building, road or other output; and bad for the firms involved who have payments delayed and may sometimes incur large legal costs.
- 1.3 In some Member States, ways of working based explicitly on collaborative principles have been introduced. These aim to promote good, productive relationships. The experience in those countries is that when the organisations – client bodies and firms – involved in a construction project commit themselves to working collaboratively, the outcome is likely to be more successful than if they had followed traditional practices. The project is more likely to be delivered on time, and within the agreed budget; disputes are reduced or eliminated, and everyone concerned with the project achieves greater satisfaction in their work.

Partnering has become the predominant way of describing a variety of organisational initiatives aimed at overcoming mistrust and adversarial practices in construction and advancing trust and productive collaboration. Partnering is the outcome of many years of research, experimental building projects and policy analysis in the construction industry and business policy system. (Country Report, Denmark)

- 1.4 The use of collaborative ways of working therefore contributes to raising the efficiency and competitiveness of construction in the European Union and assists the overall economic competitiveness of Europe. Recognising this, in 2007 the Directorate General for Enterprise and Industry of the European Commission commissioned a research consortium led by Manchester Business School, UK to undertake a study of the use of 'voluntary arrangements for collaboration in the provision of construction services'. The study is one of a series undertaken since publication of the

Commission's Communication on the competitiveness of the construction sector¹ which set out its strategy towards construction. This Guide is an output from that study. Together with the background reports on which it is based, it is also available as a download from [Website reference].

Structure of Guide

1.5 The Guide is structured as follows:

Part I

Section 1	This introduction
Section 2	A review of different forms of collaborative ways of working in construction, benefits that stem from their adoption and issues to consider when embarking on collaborative relationships
Section 3	Advice on the key features of collaborative relationships, and on supporting measures that aid their successful creation and development, based on experience in countries where such arrangements have been employed.
Section 4	A brief summary of the implications of EC Procurement Directives and other market-related legislation for collaborative ways of working, with particular reference to the need to ensure that such relationships do not present barriers to SMEs
Section 5	Selected sources of further information

Part II

Case Studies drawn from range of countries, showing how different types of collaborative relationship have been implemented in practice, with outcomes, benefits and lessons.

Aims of Guide

1.6 This Guide provides an introduction to collaborative ways of working in construction, in order to encourage client organisations and firms within the industry to take the first steps in collaboration. It sets out some basic issues and principles so that those responsible for commissioning and undertaking construction projects can make informed decisions on whether to explore collaborative ways of working. It does not attempt to provide detailed advice on how collaborative relationships should be established, since this will need to reflect local practices, expectations and legislation. But it includes some suggestions for further reading, in Section 5.

¹ COM(97)539 – 5th November 1997

- 1.7 As noted earlier, construction firms co-operate in the normal course of business to deliver the outputs of the industry. This Guide builds on this 'normal business practice' by presenting approaches and measures that explicitly foster and reward collaboration amongst construction interests and between them and clients, leading to a more successful and satisfying experience for all concerned.

'We have to convince crucial actors, from designers to construction companies and manufacturers, that there actually *are* ways of working that promote projects that are delivered on time and budget and within the framework of the client's quality expectations.' (CEO, architectural practice, Sweden)

- 1.8 The Guide is relevant to all those who participate in construction projects, not only 'new-build' construction but also refurbishment and maintenance works and the management of buildings and infrastructure facilities. It is particularly directed to:
- Clients (in both public and private sectors) who commission such projects
 - Designers who advise clients on architecture, engineering etc
 - Contractors responsible for actual construction, both through their own staff and through their relationships with sub-contractors and specialist installers
 - Providers and installers of specialist construction products.
- 1.9 Some aspects of collaborative ways of working may be reflected in the contractual or financial structures that link the parties to a project and so the Guide is also relevant to legal, financial and other specialist advisers concerned with construction.
- 1.10 Small and Medium Enterprises (SMEs) account for the great majority of construction firms. They have much to gain from the adoption of collaborative ways of working; not only may they be able to expand their market opportunities by collaborating with other firms, but a collaborative environment provides a better business environment, with fewer disputes, greater assurance of prompt payment etc. Hence the Guide is also addressed to policy interests and representative bodies who can influence the business environment for SMEs.
- 1.11 It is hoped that the Guide will be particularly helpful to firms and client bodies in countries where collaborative ways of working have not so far been widely used. However, it must be emphasised that **it is not a definitive guide to EU public procurement and competition requirements or to the implementation of collaborative relationships in any individual Member State**. National legislation and other requirements may influence or limit the use of the types of collaboration discussed in the Guide and of the supporting measures that are outlined. Thus any implementation of collaborative relationships should take place only after appropriate local advice has been obtained.

2 REVIEW OF COLLABORATIVE RELATIONSHIPS

Types of collaborative arrangement

2.1 This Guide considers five types of collaborative arrangement, but there are overlaps, and in practice, the relationships that exist among firms and between them and clients may include elements of several types of arrangement. Hence it is more important to focus on the principles of collaboration than to be concerned about fitting any intended relationship into a pre-defined model. Four of the types of collaboration outlined below normally involve the client for construction works while one ('construction consortium') concerns collaboration amongst supply interests only.

2.2 The types of collaboration are:

- *Project partnering* – where the client and principal supply parties formally agree to work collaboratively in a single project. This agreement is often set down in a 'partnering charter' or similar document, or reflected in the use of a form of contract that has collaborative features. The relationship is normally underpinned by agreements about sharing of cost savings, resolving disputes without recourse to legal action, etc.
- *Strategic partnering* – where a client decides to work with a defined set of supply interests over a number of projects. The actual works to be carried out may not be defined at the start of the arrangement. The partners aim to improve the quality of their relationships and the level of their performance over the course of the projects. These intentions are preferably formalised into mutually agreed targets and commitments.
- *Framework arrangement* – this is similar to strategic partnering in that a client selects certain suppliers to supply services for a defined period, with the actual works not being defined at the start of the period. When a project has been defined, one of these suppliers is then chosen to deliver it. Often, but not invariably, a framework arrangement concerns smaller items of work. The arrangement may not include a formal commitment to performance improvement but the parties express a greater element of collaboration and a desire for mutual benefit than if there were just a contract between them.
- *Alliance* – this is a particular form of project organisation in which the client and the principal supply interests create a joint organisation to deliver a project². This organisation may have its own staffing, accounts etc. The *alliance* form of collaboration has been used to deliver large infrastructure projects. In its strongest form, the client

² While *alliance* is defined as an integrated project organisation in this Guide, in some documents, the term is used to describe *project partnering* or *strategic partnering* arrangements.

and suppliers form a jointly-owned company to construct and manage the infrastructure.

- *Construction consortium* – where a group of supply interests come to an agreement on the joint development and marketing of their services. The aim of the consortium is therefore to enhance the overall market competitiveness of its member firms. Of course many ‘consortia’ are formed in order to tender for individual projects, and in some EU Member States (eg Belgium, Germany) there are special legal provisions which permit these to be registered as ‘temporary companies’³. But in this Guide a *construction consortium* is not focussed on a single project; it has a longer period of existence, enabling the firms involved to tender jointly for future projects, perhaps offering a ‘package’ of expertise or a specialist product that could not be provided by any single firm in the consortium.

The Case Studies in Part 2 of the Guide illustrate all five types of collaboration – see the Overview on page 32.

Characteristics of collaborative relationships

‘Construction is Teamwork’ Title of a practical Guide to partnering and collaboration produced in the Netherlands in 2007.

- 2.3 The key characteristics of a collaborative relationship are *trust* and *openness*. The measures discussed in Section 3 of the Guide are designed to foster and reward the development of trust and open relationships amongst the parties to the arrangement, and to encourage actions that will result in mutual, and not just individual, benefit. All the partners in the project, or the consortium, then benefit from the relationship.
- 2.4 A further important feature of collaborative relationships is that the parties have no guarantee of the outcome. The parties to the relationship enter into it because they believe that it will lead to more successful projects and improved business prospects, particularly for themselves and maybe also for the other parties to the relationship. They hope and expect that there will be a development of trust and mutual confidence in each other so that overall a higher level of performance, and a more satisfying outcome, will be achieved. But there is no certainty that this will happen; it will depend on the commitment of each party to the relationship.
- 2.5 Collaborative relationships also mean that some of the parties voluntarily give up some benefit or freedom that they might otherwise claim for themselves. Examination of the five types of collaborative relationship outlined earlier shows that in every case at least one party to the relationship has made this decision. In the case of *project partnering*, for example, the client may decide to share savings with other members of

³ ‘Société momentanée’ – a company without legal status, established to accomplish a specific task, in which the partners agree roles and responsibilities but each is jointly and individually liable for the activities of the company.

the project team, rather than retain them all. A *framework arrangement* normally restricts the client's choice of supply firms to those within the framework. Creation of a *construction consortium* is likely similarly to mean that firms will have some constraints on their ability to develop the same type of business with firms outside the membership of the consortium.

'[Project partnering is] a type of collaboration in a construction project based on dialogue, trust, openness and with early participation from all actors. The project is carried out under a mutual agreement expressed by mutual activities and based on mutual economic interests'

Guidelines for partnering, National Agency for Enterprise and Construction, Copenhagen (2004)

- 2.6 It is important to recognise that a collaborative relationship is not a replacement for a contract. Most of the approaches and measures considered in this Guide aim to stimulate and support collaboration among firms and other organisations that also have contractual obligations to each other. Some measures that promote collaboration involve changes to established contractual conditions and in some countries collaborative forms of contract have been developed. Use of such a contract will be helpful. But many of the measures taken to promote collaboration operate alongside the contract and provide an environment in which the various interests can discharge their contractual obligations in the most effective manner.

The benefits of collaboration

- 2.7 The benefits to clients and supply interests from collaborative arrangements are both tangible (and capable of being expressed in financial terms) and non-tangible, such as increased satisfaction in the workplace. Of course, the complete range of benefits will not necessarily be realised every time – the participants in each arrangement will decide which aspects of the collaboration should be the particular focus of attention.

The Benchmarking Centre for the Danish Construction Sector, surveyed the experiences of 18 public, 7 semi-public and 10 private construction clients with project partnering compared with traditional projects. Overall, there was little doubt that construction clients preferred a partnering approach over a traditionally organised construction project. They particularly stressed 1) better fulfilment of client requirements budget 2) bringing the client into the planning of the project, 3) absence of budget overruns and 4) higher value for money (Country Report, Denmark)

- 2.8 Where collaboration involves both clients and supply interests, as in *project partnering*, benefits arise from the more effective delivery of projects and experience shows that these benefits can include:

For the client:

- More reliable delivery – with project budgets and timetables maintained even when there are unexpected problems or late changes in requirements
- Hence, occupation and use of the building or facility on time, without the inconvenience and possible extra costs consequent on late completion
- Fewer (or even zero) formal disputes or instances of conflict
- Cost savings
- Higher quality of construction
- Greater satisfaction with the final output and with the design and construction processes and relationships through which it is accomplished.

[See the Case Studies, for example 2, 4, 6, 10, 12, 14, 15]

For the supply firms

- Greater clarity and consistency in project objectives
- Improved communications with the client and supply partners, *leading to*
- Improved ability to programme the work efficiently, and to solve or avoid problems *and*
- Higher levels of innovation, improved final design and fewer design changes
- Greater focus on project success and fewer disputes, which divert management resources
- Greater assurance that payment schedules will be kept, with more rapid agreement on final accounts
- Higher job satisfaction amongst employees

Collaboration provides a fertile breeding ground for renewal and creativity. Parties that combine their strengths can capitalise effectively on their available knowledge and expertise: to stimulate integral thinking, find innovative solutions, and convert tailor-made applications into creative concepts with an added value in terms of marketability or synergy. (Contractor with experience of partnering, The Netherlands)

- 2.9 The general view of managers that have participated in partnering arrangements is that they would not wish to revert to previous, more adversarial, ways of working.

Post-completion interviews were carried out with all key personnel and not a single person interviewed wanted to return to traditional ways of working. [Case Study 10, Göta Tunnel, Sweden.] A survey of Swedish construction clients found that such views were widely shared. (Swedish Country Report).

2.10 Other forms of collaborative arrangement involving clients can lead to additional benefits. Relationships such as *framework arrangements* and *strategic partnering*, which extend over a number of projects, will typically result in:

- Better use of knowledge - as firms gain familiarity with each other and with the client's requirements and ways of working
- Improved transfer of knowledge and experience from previous projects - since firms share a common background of understanding of those projects
- Continuous improvement both in the effectiveness of project delivery and in the quality of the relationships, with the potential for reductions in project timescales and overall costs [Case Studies 10 and 18]
- Savings in tendering costs, for both clients and suppliers [Case Study 12]

2.11 Organisations that have created *alliances* have found that their integrated project structures enable complex projects to be delivered more effectively than traditional approaches, and in some cases consider that it would be impossible to deliver the project by conventional means. [Case Study 15]

<p>'Alliances are formed are to enable a client to meet delivery challenges they cannot realise by traditional means.' (Director, energy sector alliance, UK)</p>

2.12 The benefits of *construction consortia* are essentially market-related. Consortia provide firms who might otherwise have difficulty in entering particular markets with the ability to compete in those markets. Hence they open market opportunities and in particular offer SMEs scope for expansion and development, sharing marketing and product development costs. [Case Studies 16 and 19] They also provide a basis for investment in the joint development of new products. [Case Studies 16 and 17]

For the community

2.13 The adoption of collaborative arrangements can lead to benefits not just for the client bodies and firms directly involved, but for communities; this may be of particular note for public sector clients:

- Taxpayers receive greater value from public projects that are accomplished more effectively, are constructed to higher quality and come into use on schedule [Case Study 5]

- Firms which have longer-term framework or strategic partnering relationships with clients have a more secure base on which to invest in skills development and training for their employees, with benefits for themselves and for the community

‘Workload assurance has enabled Thomas Vale plc to invest £1m in a purpose-built training centre ‘The Forum’, in which some 24 of the company’s supply partners have joined as sponsors.....This investment in the future with its clients and supply partners has produced significant training investment of around £2m annually in conjunction with national training bodies and local training providers.’ (Case Study in *Taking Advantage – How SMEs can become successful framework contractors* (See Section 5))

- The innovative capabilities of SMEs and other firms can be fostered

- 2.14 Finally, collaboration supports the development of a sustainable construction sector. Achieving high environmental performance in buildings and infrastructure works requires the integration of many aspects of design and construction and means that there must be very good communications across the project team. Collaborative ways of working support the development of such communications and so promote high environmental performance and a reduction in the level of wastes produced during construction. [\[Case Study 5\]](#)

Which projects are suited to collaborative arrangements?

- 2.15 In principle, any project can be carried out through collaborative ways of working. But establishing collaborative relationships requires investment, notably of time, by the clients and supply firms involved. Managers, particularly, have to make time available for learning about collaborative principles and processes, getting to know their counterparts in other organisations, and developing collaborative processes. There may also be a need for expenditure on external assistance, with consultants helping to develop some of the measures (such as those outlined in the Section 3) that support collaboration.
- 2.16 Experience shows that such investment can be justified because of the cost savings and other benefits that arise from collaboration. But clearly the potential for such savings will vary across projects, with larger and more complex projects offering more scope for innovation and improved delivery through adoption of collaborative ways of working. Smaller or straightforward projects can of course also benefit from collaborative behaviours, but may not justify the kinds of measures discussed later.
- 2.17 Broadly, *project partnering* will show the greatest benefits when:
- There is uncertainty in the final cost of the project, perhaps because of factors that cannot be determined prior to the commencement of works on site

- There are other challenges, such as a complex design, a tight timescale or a need for decisions which will affect the final design but which cannot be taken until late in the project process
- The project is of significant size, so that the scale of potential benefits will justify the development of collaborative arrangements [Case Study 4]

2.18 These are the circumstances in which it is especially important to have everyone committed to the success of the project, contributing ideas and experience and ensuring excellent communications across the project team. For the largest projects, they could lead to a decision to create an *alliance*.

2.19 The same considerations apply to the forms of collaboration that cover more than one project, such as *strategic partnering*, but other factors need also to be taken into account:

- Are the projects sufficiently similar to be able to be carried out by the same set of firms?
- Can the firms involved be offered reasonable continuity of work, to maintain their interest and provide them with financial benefits?
- Is the collaboration likely to be sufficiently important for the participants, so that, over the period of the collaboration, they will each commit time and management resources to maintaining and improving relationships?

2.20 *Construction consortia* will be formed out of individual circumstances, to address distinctive markets, but crucially the firms involved must be able to see that together they are able more effectively to address a potential market than if they operated individually. [Case Studies 19 and 20] Again, the potential size and continuity of that market will be important factors in the decision to invest in the creation of the consortium and its associated procedures. As with the longer-term project relationships, a key issue will be the significance of the arrangement to the participants, so that they actively contribute to it.

Case Study 9 concerns a consortium which was initially successful but which has now been terminated because of a change in market conditions. Case Study 17 describes a consortium which has been in existence for some years but has only recently found market conditions that enable it exploit its jointly developed housing product.

3 SUCCESSFUL COLLABORATIVE RELATIONSHIPS

- 3.1 This Section of the Guide provides a summary and discussion of factors which are considered important in the creation of successful collaborative relationships and identifies some specific ways of fostering such relationships in construction. It is based on the experience in the countries studied during the preparation of this Guide. However, in other Member States, firms and clients for construction will have different perceptions on how collaborative behaviours can be fostered, and their traditional ways of working will be different. Organisations wishing to explore collaborative relationships should therefore take the suggestions in the Guide as a starting point and then complement them with local consultations and advice.

Personal relationships are at the core

- 3.2 Although the parties to collaborative arrangements are private and public organisations (supply firms, private and public clients etc), the fundamental relationships are those that individuals have with each other. Collaboration is about people – their attitudes, behaviours and actions. The various measures considered in this Section for promoting and supporting collaboration seek to influence individuals' attitudes and behaviours, either directly (eg through helping individuals to get to know each other) or indirectly by changing the ways in which their firms relate to other parties. The aim is to create the conditions where individuals are able to:

- trust each other, and by extension trust each other's organisation
- be open with each other, in order to identify and address problems in the work or the relationship,
- show respect for each other's views, seeking to understand the factors that have led to them, and
- be flexible, without compromising fundamental principles or objectives, in order to achieve mutual benefit.

‘After a first acquaintance, the person involved is more important [to a relationship] than the organisation they represent’.
(Developer, the Netherlands)

‘The more time you are with a client, the more value you can add for him.’
(Contractor, the Netherlands)

- 3.3 There is no single ‘blueprint’ that defines how such relationships can be created and maintained. The approach must depend upon the context of the proposed relationship, including:

- national and regional cultures
- the extent to which normal construction practice includes collaborative elements
- national regulations and other requirements that govern commercial relationships

Leadership is crucial

- 3.4 Experience shows that collaborative relationships will only succeed when there is clear commitment to the relationship from all the participants. Individuals in the participating organisations will look to their senior managers for evidence of this, and will be quick to detect divergence between statements that support the principles of collaboration and actions that show little regard for the interests of other parties. Consistency in attitudes, behaviours and actions is essential.
- 3.5 This may pose challenges for senior managers, who may be accustomed to different, more adversarial, modes of behaviour. A key question for any manager considering whether their organisation should be party to a collaborative relationship is: 'Am I personally prepared to provide the leadership required for this relationship to be a success, and to demonstrate my commitment to it through my attitudes and behaviour?' Advice and training may be necessary.
- 3.6 *Construction consortia* are likely to have an individual who plays a key role as a focus of the consortium, perhaps as Co-ordinator or as the principal contact with prospective customers. That person's behaviours will similarly be scrutinised by their colleagues in the consortium.
- 3.7 Where clients are involved in collaborative relationships, the senior manager involved from the client organisation will bear particular responsibility for the creation and development of the relationship. They 'set the tone' or 'establish the climate' for the relationship. They will need:
- To be explicitly and publicly committed to working in a collaborative manner
 - To propose arrangements (such as those outlined below) which will support collaboration, and as necessary provide resources for them
 - To enter into open dialogue with the parties on the objectives, targets and procedures of the collaboration
 - To display behaviour consistent with a collaborative approach, such as willingness to address difficulties objectively and without assigning blame, and to be flexible in approach.

‘Client leadership is not to be confused with client dominance; this would breach the principle of collaboration. Client leadership is a fine balance between on the one hand exerting influence and taking decisions - recognising that the client has ultimate responsibility for the project - and on the other being open to ideas from all sources, including those that may question some key aspects of the project, in order to achieve the best outcome’ (Client Best Practice – an International Perspective.

(Discussion note for meeting of International Construction Clients Forum, Port Elizabeth, 2005.)

- 3.8 Some clients may wish to appoint advisers to assist the development of the appropriate qualities and capabilities in their organisations. The appointment of a ‘partnering leader’ may also be helpful. This is an external adviser to the parties in the collaboration who is jointly appointed by them and who assist the development of the collaborative relationship by helping to develop appropriate behaviours and collaborative processes. [\[Case Study 7\]](#)

Collaboration as culture change

- 3.9 The crucial role played by individuals in a collaborative relationship means that changes in personnel can greatly affect that relationship. The appointment of managers who are not sympathetic to a collaborative approach may cause breakdown in relationships, and if key people have not been involved in the creation and development of the relationship they may not have the same level of commitment to it. Paragraphs 3.28 to 3.30 discuss how good performance data can contribute to these issues. [\[Case Study 7\]](#)

- 3.10 Such problems will occur when the adoption of collaborative ways of working has been confined to parts of an organisation and not seen as an aspect of culture change for the whole organisation. While experience of collaboration can undoubtedly be gained through individual projects, making a strategic commitment to collaboration as a normal way of working will require a ‘culture change’ programme tailored to the needs of the individual firm or client body, and is likely to involve external assistance.

Selecting the right partners

- 3.11 Adopting a collaborative approach will influence a project from the start, not just once the works have commenced on site. In particular, procurement processes will need to be consistent with the aim of collaboration. Conventionally, firms invited to tender are selected on criteria that relate to the intended works, with factors such as experience and capabilities being prominent. However, the selection of parties to a collaborative relationship needs also to take into account the quality of relationships that the organisations and individuals concerned will establish with other parties, and their ability to operate within the

procedures of the relationship. Thus the selection process may involve evaluation of:

- Senior management commitment to collaborative ways of working
- Evidence of appropriate capabilities in key individuals, or willingness to invest in relevant training etc
- Experience of team-building processes
- Willingness to modify work processes to meet collective requirements
- Ability to provide data relevant to the monitoring of the relationship (see below)

[Case Studies 1, 3 and 8]

3.12 Similar considerations will inform the choice of members of a *construction consortium* where it is intended that there should be joint development of capabilities.

3.13 Inevitably, subjective judgements will need to be made and client organisations subject to the requirements of EU Public Procurement Directives will need to take advice on how the relevant criteria should be included in decision processes.

Early appointment of key members of the project team

3.14 Another way in which procurement can foster collaboration is through the early appointment of key members of the project team. This is strongly recommended as a way of creating an integrated team to deliver the project. It enables each member of the team to contribute their expertise to the project and to become committed to it. In some Member States (eg the Netherlands and Belgium) this is a familiar process which results in the *Bouwteam*. [Case Studies 2, 5, 6 and 8]

3.15 The procurement process may appoint each supply interest separately, bringing each into the project team. But an alternative approach is to invite proposals from consortia of firms that may already have experience of working together. This enables the project to benefit from the relationships established through previous collaborations. [Case Studies 3, 8, 12 and 18]

3.16 The number of supply interests appointed at this early stage must be a matter of judgement in the light of the requirements of the individual project. It would normally include the main design and contracting firms, and also specialist suppliers and sub-contractors where these are crucial to the success of the project. The appointment process must comply with the requirements of EU and national public procurement regulations, where these apply (see Section 4).

Establishing common commitments and objectives

3.17 While trust is at the core of collaboration, having a document that sets out the principles of the collaboration and its objectives establishes a reference point for all concerned. This may take the form of a 'partnering charter' or the constitution of a consortium, or an agreement that accompanies a legal contract. Figure 1 illustrates the kind of

commitments that are made in such documents. Having the document publicly signed by the parties at a formal ceremony is a way of underlining its significance. It may also be helpful to have copies of the document displayed prominently in the offices of the firms involved.

[\[Case Study 4\]](#)

<p>The Partners undertaking [name of project] commit to the following core values:</p> <ul style="list-style-type: none">• Mutual trust, respect and integrity• Effective communication• Excellence• Effective listening <p>Our mutual goals are:</p> <ul style="list-style-type: none">• High quality• Rigorous safety standards• On-time hand-over• Completion within budget and at reasonable profit• Timely resolution of disputes at lowest levels <p>We therefore, as a team, commit to:</p> <ul style="list-style-type: none">• Working together in an open and honest environment• Achievement of successful partnering• Making the [project] an example of excellence in construction <p>Signed by: [Senior executives of all firms]</p>
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Figure 1: Example text of partnering agreement or ‘charter’

- 3.18 Parties to collaborative relationships will need to be clear about the relationship between the content of any such agreement and the provisions of any contract between them. The agreement should not conflict with the contract or inadvertently establish new responsibilities which could be legally enforced. Indeed, it may explicitly state that it is not legally binding.
- 3.19 Some aspects of collaborative relationships (particularly those concerning financial arrangements and dispute resolution procedures, discussed below) may require ‘standard’ forms of contract to be amended. Whether this is possible will depend upon local circumstances. In some Member States, new forms of contract have been developed which incorporate collaborative elements but many projects in these countries have been successfully executed through collaborative arrangements established within a conventional contractual framework. Thus the introduction of collaborative ways of working need not depend upon the development of revised forms of contract, even if some of the supporting measures outlined below cannot then be implemented.
- 3.20 The number of supply interests included in the collaborative relationship will be a matter of judgement. Confining the formal relationship to the key interests in a project will facilitate the development of close relationships

but collaborative working should ideally be extended to a wider range of suppliers. It is possible for principal suppliers to have their own version of the 'charter' covering their dealings with sub-contractors and other firms, and this will be of benefit to the SMEs that typically constitute the majority of supply firms. [\[Case Studies 9, 11 and 15\]](#)

'Connections in the chain have to speak each other's language. When the group of collaborating parties is too large, language problems will occur.'
(*Suppliers in Construction*, ING Report 2007, The Netherlands)

'Over 65% of our cost is Tier 2 or below and therefore we have to develop collaboration throughout the delivery team to ultimately deliver benefit. This only happens if the client drives it.' (Director, water sector alliance, UK)

- 3.21 A *construction consortium* will, by definition, have all its members included in the collaboration.

Workshops – initial and continuing

- 3.22 The 'partnering charter' or comparable document may be one of the outcomes of an initial workshop held to start the process of creating collaborative behaviour and transforming a set of individuals from different backgrounds into a team. Such a 'kick-off' workshop is strongly recommended at the start of a collaborative relationship. It is not only an occasion for open discussion of the objectives of the relationship and of the work to be undertaken, but an opportunity for social interaction which strengthens personal relationships. The workshop – which for a large project would normally extend over two days - should be led by a trained facilitator. [\[Case Study 1\]](#)

Working together does not happen automatically; you have to organise it. (*Building is Teamwork* Council for Reform in Building and Construction, The Netherlands)

- 3.23 The workshop programme should be tailored to the needs and priorities of the relationship. But an initial *project partnering* workshop might typically include:
- Introductions by all participants, with their observations on their objectives for the project and their concerns
 - Team-building exercises - which may take the form of games that stimulate and show the benefits of collaboration

- Discussion of project objectives, leading to a set of agreed objectives
- Discussion of performance criteria and how these might be measured, leading to an initial set of targets
- Discussion of measures that will promote collaboration, for example: joint decision-making structures, financial incentives, dispute resolution processes, sharing of intellectual property etc
- Discussion of key challenges, with groups considering possible approaches, allocation of responsibilities and risk management
- Summarising agreements in a document signed by all parties.

3.24 Further workshops are likely to be helpful in larger projects, to prepare for key stages of the work.

Clarity in responsibilities and processes

3.25 Experience shows that successful collaborations need to be underpinned by clear and agreed processes and management structures. Early agreement on these issues is important and, as indicated above, initial discussion can take place at the kick-off workshop. This may lead to groups being established to develop proposals for subsequent agreement at senior executive level. [\[Case Study 14\]](#)

Team-building

3.26 Successful collaboration results in a shared commitment to the objective of the collaboration, in contrast to pursuing the interests of individual firms. Holding workshops at key points in the project can assist this process, by enabling objectives and targets to be agreed jointly. [\[Case Study 21\]](#)

3.27 Other measures that help to break down barriers between people and organisations include:

- Locating people from different firms in the same set of offices, with no obvious boundaries between them
- Establishing shared databases and employing common IT systems for design, production and administration
- Creating a shared identity for promotional purposes, including a distinctive logo, Website etc
- Ensuring that everyone is in touch with the latest developments, through newsletters, news flashes etc
- Arranging social events, particularly to celebrate significant achievements.

[\[Case Studies 1 and 4\]](#)

Rigorous performance monitoring

3.28 A risk associated with the introduction of collaborative relationships, particularly those such as *framework arrangements* that extend over more than one project, is that they may remove some of the pressure to perform that is present in conventional, highly competitive market situations. This can cause dissatisfaction and may bring the concept of collaborative ways of working into disrepute.

- 3.29 It is therefore important that performance measures, and the means of monitoring them, be agreed at an early stage in the relationship, for example at the kick-off workshop. These measures should be ‘SMART’⁴ in that they should include not only measures directly linked to the work to be accomplished, such as the completion of identifiable stages of a project or the progressive reduction in defects, but also those that monitor the quality of the collaborative relationship. The latter may include both subjective judgements (for example, assessments of how well firms have contributed to problem-solving) and objective measures such as the number of disputes. Regularly monitoring performance in this way is important to maintaining the health and vitality of a collaborative relationship; the data should be discussed regularly by all the parties and corrective action, if necessary, agreed. [Case Studies 1, 10, 15]
- 3.30 Performance monitoring not only underpins the health of a collaborative relationship but helps everyone – within and outside the relationship – to have confidence that the arrangement is continuing to provide value for money. This is important for public sector clients who have entered longer term collaborative arrangements such as *strategic partnering*, and will wish to be assured those arrangements are still effective. It is also important for the managements of firms involved in longer term collaborative relationships; changes in personnel directly involved in the collaboration may lead to reduced commitment to the relationship while changes at senior executive level, bringing in executives who were not involved in the creation of the collaboration, may cause the value of the collaboration to be questioned. Having good performance data is important in maintaining commitment.

Financial incentives

- 3.31 Financial incentives that reward distinctive contributions to the collaborative relationship are clearly important influences on the behaviour and actions of parties to the relationship. They are at the core of the commercial structure of the relationship. The sharing of financial risks and rewards is most evident in an *alliance* where the parties each have a financial stake in the common organisation, but other forms of collaboration may also incorporate financial incentives.

‘If the commercial model does not create strong incentives for collaboration, then the right behaviours will not be sustained. The commercial model should provide alignment with client requirements, incentive joint ownership through shared returns and incentives for continuous improvement.’ Director, water sector alliance, UK)

- 3.32 Thus projects conducted under collaborative arrangements commonly have an agreed ‘target price’, with any savings achieved or excess costs shared according to a pre-defined formula – a ‘pain/gain share’ arrangement. There may also be a ‘Guaranteed Maximum Price’ so that the supply interests are taking the risk of costs exceeding that level.

⁴ Specific, Measurable, Achievable, Realistic, Time-related

Although the client is giving up some potential savings, when there is uncertainty over the final outcome, such arrangements offer both protection against excessive costs and an incentive to all parties to propose measures that will result in savings. The final cost may well be lower than if such arrangements had not been introduced. [\[Case Studies 6 and 7\]](#)

3.33 Other financial measures that can help to foster collaboration on a project include:

- Guaranteeing an agreed level of profit for the supply parties, independent of the final out-turn price. Proposals which reduce the final price to the client do not then disadvantage the suppliers
- Introducing 'open-book' accounting, so that the client has access to all the costs incurred in the course of the project
- Creating a 'project bank account' into which all payments are made by the client and from which suppliers are paid. This facilitates prompt payments to sub-contractors and other suppliers; these are often SMEs who may not be directly covered by the main partnering agreement, but this kind of measure extends the spirit of collaboration to these firms.

3.34 The financial arrangements that support a collaborative relationship are likely to be reflected in the contractual relationships between the parties. Because of that, they must be consistent with local contract legislation and other requirements.

Collaborative approaches to resolving disputes

3.35 In a complex construction project, differences of opinion will inevitably arise and at times errors will be made. In order to encourage open discussion of contentious points, and early notice of any errors, collaborative relationships often embody a principle of 'no blame' so that discussion focuses on the resolution of the issue and not its cause.

3.36 But discussion at 'working' level may not be able to resolve the issue and experience shows that it is very important for there to be a clear process through which disputes can progress on an agreed timescale. This process – agreed early in the relationship - often involves an agreed 'staircase' of meetings between successively higher levels in the organisations concerned – perhaps assisted by expert, jointly appointed advisers - with the aim that the dispute be resolved at the lowest possible level and in the shortest possible time. The cost of delays caused by disputes can be very substantial and rapid resolution of issues contributes to reducing construction costs. [\[Case Studies 10 and 14\]](#)

3.37 However, there may still be instances where a dispute cannot be settled directly. While conventionally this might mean recourse to legal action, in many collaborative arrangements the parties explicitly agree that they will not litigate in the case of disputes and that they will be bound by an alternative agreed procedure. Such alternative procedures include:

- *Mediation* – where an independent mediator assists the parties in finding a settlement but does not express their own view unless requested by both parties
- *Conciliation* – where the mediator acts as above but in the case of non-settlement does make a recommendation for the parties to consider
- *Adjudication* – where the parties accept a judgment by an independent adjudicator.

3.38 As with financial arrangements, these aspects of the relationship are likely to be incorporated in contractual conditions as substitutes for more conventional practice, and therefore should be agreed only when consistent with local regulatory and other requirements.

Collective management of risk

3.39 Encouraging early identification and open discussion of problems will do much to reduce risks. [Case Study 1] The adoption of a ‘no-blame’ approach and avoidance of litigation will also assist the development of an open approach to risks and problems. However, if the parties in a collaboration relationship continue to bear their individual risks, this may inhibit their willingness to put forward innovative solutions.

3.40 Collective management of risk helps to overcome this. Some Member States (eg Belgium, France) already have well-established project-based insurance systems and associated technical assessment systems, which serve to reduce the risk to individual firms. Such insurance may not be available in all Member States, but where it is available it can support project-based collaborative relationships⁵.

The client for the construction of Terminal 5 at Heathrow, BAA plc, accepted the risks of the project in order to promote collaboration by the supply interests and the development of innovative solutions to a set of highly complex design and construction problems. The ‘Terminal 5 Agreement’ was considered to be a very significant factor in the delivery, on time and to budget, of this £4.3bn project. (UK Country Report)

⁵ DG ENTR have commissioned a study of insurance for construction works (ITT ENTR08/007 – 28th May 2008)

4 COMPLIANCE WITH EU AND NATIONAL POLICIES AND REQUIREMENTS

- 4.1 *This section contains general guidance on the relationship between collaborative ways of working and the requirements of EU procurement and competition legislation. It is not intended to be a definitive guide to the proper application of such legislation. Users of this Guide should note that neither the authors nor the European Commission can be held liable for any loss, damage or expense arising from the use of the guidance in this document. Readers are recommended to take appropriate professional advice and/or legal advice to ensure that any proposals they may have for the use of collaborative forms of relationship in public procurement comply with all relevant legislation.*

EU Procurement Directives

- 4.2 It is essential that bodies that fall within the scope of the EU Procurement Directives⁶ should comply with those Directives (as incorporated into national legislation) when establishing collaborative relationships with firms in connection with construction works. Guidance on these matters should be sought from national authorities.
- 4.3 The general principle is that there must be open competition for the supply of construction services, against defined selection criteria. When it is the intention to appoint members of a project team at an early stage, before the design has been sufficiently developed to enable a final cost to be determined, particular care will be needed when setting these criteria. One approach that has been used in some Member States is to appoint a contractor on a fee basis to contribute to the development of the design, with award of the construction contract dependent upon a further proposal including a firm price. [\[Case Study 14\]](#)
- 4.4 A similar two-stage process is required when framework arrangements are established, with initial selection of parties to the framework being made on criteria which relate to the generality of the work envisaged (eg pricing) and a second selection process taking place for specific items of work from amongst the firms in the framework. Because the firms' suitability for the work will have been determined during the earlier process, and key aspects of the eventual contract such as conditions and pricing may also have been settled, the second selection is likely to be a simpler and more rapid process than would take place in the absence of the framework. [\[Case Study 12\]](#)

National requirements

- 4.5 National requirements, deriving from legislation or other sources, will influence the way in which collaborative relationships develop in individual Member States. National requirements may, for example:

⁶ Directives 2004/17/EC and 2004/18/EC

- extend the requirements of the Works Directive to public procurements below the threshold level of that Directive
 - mandate the use of standard forms of contract, without amendment
 - place statutory responsibilities on architects and other design interests.
- 4.6 But national legislation may also facilitate collaboration; the example of the 'temporary company' that can be created in some Member States has already been mentioned.
- 4.7 As with requirements stemming from EU legislation, guidance should be sought as necessary from national authorities.

Competition and SMEs

- 4.8 It is important that the introduction of collaborative ways of working should not reduce opportunities for SMEs, which make up the great majority of construction supply interests. Municipalities and other local public authorities will be particularly concerned that such SMEs continue to be able to provide employment opportunities for local residents. *Construction consortia* offer SMEs a way of competing for projects that might be beyond their individual resources; however, some other forms of collaboration may serve to reduce opportunities for SMEs unless due care is taken when establishing the relationships. [\[Case Studies 11 and 13\]](#)
- 4.9 SMEs have limited management resources, and their managements will necessarily focus on operational matters. The investment of management time required for *project partnering*, not only in the development of appropriate statements of commitment, but also in workshops and perhaps also in developing an understanding of unfamiliar payment and dispute procedures, may be beyond their management capacity. Hence it is important that when SMEs are involved in such collaborations, these processes should be tailored to their resources, and introduced only after full consultation – in the spirit of collaboration.
- 4.10 The types of collaborative relationship that cover a number of projects (*framework arrangements* and *strategic partnering*) may put up additional barriers to SMEs, since the volumes of work to be performed may be beyond their scope. While public bodies cannot confine opportunities under these sorts of relationship to SMEs or restrict entry to local firms,, steps can be taken to enhance opportunities for SMEs. These include:
- having different frameworks for projects of varying sizes - for example, a framework for projects under €1 million which would be suited to very small firms
 - having tendering and performance management arrangements that do not impose requirements on SMEs that are outside their capabilities
 - holding consultations with SMEs on future opportunities, identifying skills gaps and training needs and stimulating appropriate provision [\[Case Study 13\]](#)

- encouraging larger firms within a framework to provide opportunities within their supply chains for SMEs who might previously have been contracted directly by the public authority.

5 SOURCES OF FURTHER ADVICE AND GUIDANCE

English language

- 1) Partnering in the Construction Industry – a Code of Practice for Strategic Collaborative Working. John Bennett and Sarah Peace.
Butterworth-Heinemann (2006). ISBN 978-007506-6498-1

A comprehensive guide to establishing collaborative relationships in construction.

- 2) A Guide to Project Team Partnering - Second Edition 2002
Construction Industry Council, London
Available through www.cic.org.uk
- 3) The Partnering Toolkit – A Guide for the whole supply chain
Building Services Research and Information Association, Bracknell. UK (2002)
ISBN 0-86022-615-8
Available through www.bsria.org.uk

The two publications above are simpler introductions to partnering, with practical advice.

- 4) The Strategic Forum Integration Toolkit (2003)
Strategic Forum for Construction, London
Available as a download from
<http://www.strategicforum.org.uk/sfctoolkit2/home/home.html>

A Web-based set of tools for the development of integrated project teams and integrated supply chains

- 5) The integrated project team – teamworking and partnering.
Achieving Excellence in Construction Procurement Guide 5 (2007)
Office of Government Commerce, London
Available from www.ogc.gov.uk

One of a set of procurement guides produced to assist UK Government Departments.

- 6) Taking Advantage - how SMEs can become successful framework contractors.
Local Government Task Force (2007)
Available as a download from www.constructingexcellence.org.uk

Guidance on establishing framework arrangements that facilitate participation by SMEs, with Case Studies.

- 7) A large range of Case Studies on collaborative working may be downloaded from
www.constructingexcellence.org.uk

Other languages

- 8) Bouwen is Teamwork! [A practical guide to collaboration] Regieraad Bouw (2007)
[in Dutch] Available from www.regieraadbouw.nl

- 9) Vejledning i partnering [Guidelines on partnering] Erhvervs-og Boligstyrelsen [Danish Agency for Enterprise and Construction] Copenhagen (2006) Available from www.ebst.dk/publikationer
- 10) Fr ån byggherre till strategisk partnering (From Construction Client to Strategic Partnering) by Gösta Fernström. Förlag Fernia consulting AB (2007) ISBN 91-631-8789-2
- 11) Partnerskap och partnering i bygg- och fastighetsbranschen (Partnership and Partnering in the Construction and Real Estate Business). by Gösta Fernström Förlag Fernia Consulting AB (2003) ISBN 91-7988-240-0
- 12) Partnering in der Bau- und Immobilienwirtschaft - Projektmanagement- und Vertragsstandards in Deutschland (Partnering in construction and real estate – project management and forms of contract in Germany) K Eschenbruch and P Racky (Editors): Kohlhammer Verlag, Stuttgart, 2008, ISBN 978-3-17-019861-6.

PART 2 – CASE STUDIES

Note: this document does not include the photos and other illustrations that will be included in the Case Studies. These may be downloaded from:

<http://www.mbs.ac.uk/research/innovation/voluntary-arrangements-steering-group.aspx>

<p>The authors of the Guide wish to acknowledge the contribution of the many individuals who provided information and illustrations for the Case Studies.</p>

Introduction to Case Studies

The Case Studies illustrate how voluntary collaborative arrangements have been employed in a wide variety of construction contexts and in a range of Member States. Most are examples of the types of collaboration considered in the main part of the Guide but two (20 and 21) show different ways in which firms have come together in a collaborative activity.

The Case Studies present the key points of each collaboration; where possible, each includes a source from which further information may be obtained.

The tables below present, first, a listing of the Case Studies and secondly an overview of the types of collaboration and construction contexts that they illustrate.

NO.	TYPE*	COUNTRY	NAME
1	PP	SE	Klockarbo Housing
2	PP	BE	Janssen Pharmaceutica
3	PP	NO	State Archives
4	PP	SE	Göta Tunnel
5	PP	DK	Öresund Link
6	PP	BE	Brussels Office Renovation
7	PP	SE	Linköping Hospital
8	PP	NO	Baerum Municipality Model
9	SP	DK	Consensus housing
10	SP	DK	Management of Danish Main Roads
11	FA	UK	Birmingham Construction Partnership
12	FA	UK	Procure21
13	FA	UK	Hillingdon Homes
14	AL	NL	Waardse Alliance
15	AL	UK	NW Gas
16	CC	FI	Concrete consortium
17	CC	NL	EspritHuis
18	CC	SE	Arcona
19	CC	IT	CIPEA
20	O	FR	FFACB
21	O	FI	Pre-project Clinic

* AL – Alliance

FA – Framework Arrangement

SP – Strategic Partnering

CC- Construction Consortium

PP – Project Partnering

O - Other

CONSTRUCTION CONTEXT	TYPE OF VOLUNTARY ARRANGEMENT FOR COLLABORATION					
	PP	SP	FA	AL	CC	O
New housing	1	9			16(iii) 17(iii)	20
New building	2, 3		11(i) 12(ii)		18 19(i)	
Infrastructure works	4, 5			14		21
Renovation/ maintenance	6, 7, 8(ii)	10	13	15		

Notes:

Numbers refer to the previous table.

(1) Also renovation/maintenance

(2) Also an example of the selection of construction consortia

(3) Also an example of product innovation through a consortium

Case Study 1: Klockarbo public housing, Uppsala

Background

Uppsalahem is a publicly owned housing company in Uppsala which owns and operates 12 500 rental apartments as well as office premises. Its annual turnover is €85m and it commissions 4-500 new apartments every year. The Klockarbo housing project, with 116 new apartments, was aimed at improving an old industrial area of Uppsala. The project started in 2005 and the apartments were occupied in 2007-8.

The Klockarbo project was undertaken through a partnering agreement which covered the client (Uppsalahem AB), the architect and engineering consultant (A5 Arkitekter & Ingenjörer AB) and the main contractor (NCC Construction AB). The client had an existing framework agreement with the architectural practice but needed to select the contractor through a process consistent with EU public procurement requirements. In this, Uppsalahem looked for:

- Suitably experienced personnel within the company, with a requirement that the contractor would be using their own staff for all key functions.
- Evidence of experience in working collaboratively, as well as appropriate experience in design and technology relevant to housing construction
- Evidence of a willingness to embrace change, with new design and production methods
- Quality and environmental management systems
- Acceptance of a fixed price for overheads and profit and open books for production costs, with an incentive system with shared risks/gains.

Partnering aspects

Uppsalahem adopted the partnering approach for a number of reasons:

- To encourage a focus on the overall project, rather than individual interests
- To take advantage through early involvement of the contractor of the sum of knowledge and experience in the team
- To reduce costs, and be more confident that the estimated would be achieved, and similarly to reduce the timescale while maintaining quality standards
- To improve risk management and effective problem solving
- To reduce the risk of disputes, with a clear 'staircase' process for dispute resolution
- To be able to use an open book approach

Overall, they considered that it would lead to a more satisfactory and satisfying way of working.

Other incentives for collaboration included a provision that savings at the design stage would be shared 45:55 with the architectural practice. The design was finished ahead of schedule and a good saving was achieved. This confirmed the value of having the architect and engineer as part of the partnering team.

The project started with a 2 day workshop with a partnering lead from the contractor's staff. Together, the partnering team developed:

- Milestones for the project
- An agreed vision "Klockarbo – partnering for attractive living"
- Goals under for headings of: customer; costs/time; design/production and collaboration. In total, 17 goals were written down on a one page partnering declaration and signed by all participants. This constituted the 'moral contract' for the project.

- Agreement that performance against all goals would be measured and followed up in workshops throughout the project. This included monitoring goals for the quality of collaboration as well as technical objectives.
- An agreed process for addressing disputes through a “conflict stairway”. Disputes would be resolved at lowest possible level within a set time, and if that were not possible would be taken to next level – from theme groups (task team) to the Partnering Group (core team) and then to the Steering Group (team of principals).

The partnering team addressed risk management collaboratively. They sought to identify and evaluate all possible risks, then to eliminate them or to set responsibilities for addressing them. The first meeting documented 60 risks and by the end of the project nearly 200 risks had been addressed.

Outcome and lessons

The project was finished on time with a substantial saving to share among the partnering team. Since the project was completed, Uppsalahem has started 3-4 new partnering projects and partnering will be its normal way of carrying out projects.

The principal lessons for partnering were:

- Implement the partnering ethos as far down each organisation as possible - including to site staff
- Have regular sessions for team development and reinforcement of collaborative behaviour – otherwise there is a risk that traditional attitudes and practices will reassert themselves.
- Having the architect as part of the team led to large benefits not just for the one project but for future projects, because of the experience that they gained.
- It would be advantageous to extend the partnering arrangements to specialist sub-contractors

Further information

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Case Study 2: Janssen Pharmaceutica Drug Evaluation Centre, Beerse

Background

Janssen Pharmaceutica required a new facility for drug safety evaluation, to house 145 research staff. The building was complex, because of the requirements for laboratories with specialist equipment and services. It was also designed to be very energy efficient, and with a high degree of security. The total floor area was 12200m² and the budget price was €45m. The project started in June 2001 with design taking place in 2002, and the facility was occupied in December 2004.

Partnering arrangements

The project was executed through a *Bouwteam* approach with early appointment of contractors and consultants etc who had previously worked on Janssen projects. There were 13 firms in the *Bouwteam*.

A formal project partnering agreement set out the objectives of the project, the division of responsibilities and the arrangements for promoting collaboration. These focused on complete openness in communications and in particular an 'open book' approach to financial aspects of the project.

In the first four months of the project, the partners prepared cost plans for their parts of the works. These, following discussion, formed the basis for the target costs.

Outcomes

The project was considered to be very successful:

- It was completed to a very high quality standard, fully meeting the clients' requirements and with all critical systems intensively tested and operating successfully before hand-over.
- A very short construction time of 64 weeks was exceeded by two weeks, but this was considered a good performance.
- The safety record on the site was excellent
- The final cost was 4% above the original budget, but this was entirely the result of additional requirements

The parties considered that a high degree of teamwork was achieved, with variations in the course of the project being handled flexibly leading to the excellent final result.

Further information

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Case Study 3: Enlargement of State Archives, Norway

Background

In 2001, enlargement of the building housing the National Archives of Norway was agreed. Planning approval was gained in 2004. Based on agreed rent levels, the project (4000 m² of new and refurbished building) had a total budget of NOK 100m (€12m). The client was the Norwegian Government's Directorate of Public Construction and Property, *Statsbygg*.

Selection of the project consortium

Statsbygg decided to carry out the project through a collaborative model of working. After a pre-qualification round, five consortia, each including a general contractor, an architect, technical advisors and sub-contractors, were invited to present proposals against a brief provided by the client in conjunction with the eventual user. The process was competitive, but had novel aspects:

- Each group was paid for their contribution
- The general contractor and sub-contractors in each consortium acted as consultants
- The selection process aimed to identify the best consortium, not the individual firms

The groups were given three months to develop a proposal which included:

- the architectural concept
- an estimate of the total production time (design and build)
- a unit price for working hours (different types) and overhead on materials
- an approximate estimate of total project price (but this was not taken into consideration during the formal evaluation of the five proposals).

The evaluation process was based on: architectural "grip" (40 % of total marks), some unit prices (30 %) and an assessment of "collaborative skill" (30 %). It was carried out by a group including representatives of the representative bodies for architects and contractors. This added transparency and credibility to the ultimate choice. The four unsuccessful teams were invited to an individual debriefing with the evaluation team.

There was no negotiation on unit prices following selection of the winning team.

Partnering aspects

The initial agreement between the client and the general contractor, acting on behalf of the consortium, included a budget for the design phase which covered participation by the general contractor and key sub-contractors in the design team. The client and the user also participated in the design process. *Statsbygg* set out their aims for the process:

- all parties should know their responsibilities and associated budget price
- all questions should be posed and answered in an open and trustworthy manner.

Following close collaboration in the design process, an estimated price for the project was established. This was defined to be the target price for the team's output. *Statsbygg* took the view that it was important at this stage to avoid pressing strongly for the lowest target price since this would prejudice successful collaboration in the design phase.

The subsequent contract was in essence a design-build contract, with savings and additional costs split 50:50 between the client and the general contractor. Any subsequent apportionment of costs and savings from the general contractor to the sub-contractors, the architect and other consultants was a matter for the consortium.

Project outcomes

The project is regarded as a success for all parties: handover was on the agreed date; quality was above normal; the final cost was 76 million NOK, which was 4m NOK below the target sum of 80m NOK (€10 m) so that the client saved 2m NOK.

Future intentions

With this project, and nine others conducted in accordance with the “Statsbygg collaborative model”, the client organisation for government buildings has established a model for voluntary collaboration that is consistent with the procurement regulations and that will be increasingly used (and further developed) in future years. Their experience so far indicates that the model is most effective with complex projects but the expectation is that the number of contracts let by traditional processes will diminish.

Further information

www.statsbygg.no

Case Study 4: Göta Tunnel, Gothenburg

Background

The Göta Tunnel takes 65000 vehicles a day under the centre of the city of Gothenburg, thus relieving surface roads near the edge of the harbour and opening up a waterfront along the river for development. Five consortia, each in partnering relationships with the project division of the Swedish National Road Administration (Vägverket) constructed the tunnel. Construction commenced in 2000, with the main construction contracts awarded in 2001. The total contract cost was 3.4bn SEK (€310m). The project was completed in the summer of 2006.

Contract arrangements

The project was carried out through five main packages of work: for the main tunnels, each pair of entry tunnels, surface works such as new roads, and the installation of services. With the exception of the rock tunnels, each was let as a design-construct contract on the basis of a statement of requirements (including compliance with the client's detailed technical standards). The contract for construction of the rock tunnels was based on a detailed design.

Following a pre-qualification process, contractors were selected, through a competitive process in which proposals were evaluated under seven headings. In priority order, these were: technical aspects, price, implementation plan, timescale, organisation, quality record, and aesthetics.

The works were essentially undertaken on a fixed price basis, with sharing of savings or extra costs. Because the technical aspects of the design-build contracts were intensely scrutinised before the award of contract, significant post-contract changes were unlikely. But contractors could propose different ways of working or detailed changes to save costs.

Partnering aspects

The partners accepted a commitment to the vision that the Göta tunnel 'should be the most successful urban improvement project and beneficial to all'. The common objectives of the partnering relationships included:

- Reducing costs and improving efficiency levels while working to agreed quality standards
- Keeping to time schedules
- Avoiding conflicts
- Having a satisfied client and end users/customers
- Minimising disturbance to the surroundings
- Maintaining an attractive worksite which improves the image of the participating firms and of construction generally
- Making the project an enjoyable experience and a reference point for good practice

Measures taken by Vägverket to promote integration of the project teams included:

- Development of a project logo
- Bringing together a large number of managers and staff, with partners, in the Gothenburg Opera House at the start of the project in order to present the vision of the project at a social event.
- Initiating a 'Right First Time' programme directed at all workers on the project irrespective of which firm they worked for. This promoted and gave advice on high quality, high environmental standards, and good safety performance. The small booklets and other literature, distributed to the workforce through the contractors, were 'branded' with the project logo.

Outcomes

For Vägverket, this was a very successful project, especially considering its complexity. It was delivered on budget and on schedule. Problems that occurred were solved together without conflict, which contrasted with common experience on infrastructure projects in Sweden.

A study of the project could not make a direct link between the use of partnering and any direct savings in time or cost but did produce clear evidence that those involved considered the project arrangements to be very beneficial. Post-completion interviews were carried out with all key personnel and *not a single person interviewed wanted to return to traditional ways of working*. They considered that it was far preferable, in terms of job enjoyment and satisfaction, to work through collaboration and teamwork, where problems are solved early and jointly, and avoiding conflicts.

Future intentions

Vägverket have a target that 30% of all projects, both capital projects and contracts for operations, should by 2010 be undertaken through their approach to partnering, which they have called 'extended collaboration'. This contrasts with the 2007 figure of around 10%.

Further information

www.vagverket.se

Case Study 5: Øresund Link

Background

The Øresund Fixed Link between Malmö (Sweden) and Copenhagen (Denmark) connects both rail and road systems in the two countries. It combines tunnels (some 3.5km of the Link is underground), an artificial island 4km long and a 7.7km elevated section. This consists of two approach bridges constructed on piers and a cable-stayed bridge with pylons 204m high and a free span of 490m, making it the longest cable-stayed bridge in the world carrying both road and rail links. The artificial island was constructed from material excavated from the Øresund seabed during the dredging of the channel for the tunnel and bridge piers. The Øresund tunnel is, by volume, the world's largest immersed tunnel comprising 20 immersed elements on the Danish side of the artificial island.

The Fixed Link was constructed in 1995–2000 and its construction thus overlapped the construction of the Great Belt bridges (1988–1998), another very large infrastructure project in Denmark. The Great Belt project was characterised by an unacceptably high number of serious accidents leading to the death of seven workers. Not only was this tragic in itself but it also led to very poor publicity for the project. Therefore, from the initial stages of planning for the Øresund Link there was an intention to establish integrated organisational structures which would lead to better project management, reducing the risk of accidents and creating a better public image for the project.

The project

The three components of the Link: tunnel, island and elevated section, were constructed under separate contracts by different consortia; Sundlink Contractors, and Øresund Tunnel Contractors were the biggest consortia.

The client, Øresund Konsortium, required special arrangements in all main and sub-contracts to ensure better project management and safety measures in order to reduce the risk of accidents and create a better public image for the project. In addition, the environmental impact of the project during construction (as well as after opening of the Fixed Link) was a major concern, particularly in relation to the project's public image.

These concerns were addressed through very early involvement of all partners and stakeholders in the project, with everyone paying special attention to safety, environmental hazards and the work environment. The aim was to achieve levels of safety and environmental practice that had not previously been realised. New procedures, managerial routines and collaborative arrangements were supplemented by financial incentives. Furthermore, the contracts included arrangements and incentives to keep the project on budget and on time.

Outcome

The project met its safety and environmental objectives and the fixed link opened on 12 June 2000, a year ahead of schedule. In accordance with the contractual arrangements, the contractors were paid major bonuses.

The positive experience gained in the Øresund project over new ways of collaborating and better interactions among project partners contributed greatly to the introduction of new forms of agreements in Danish and Swedish construction projects aimed at promoting collaborative working. As such the Øresund project was a key test bed for the introduction of 'partnering' in public clients' construction projects, and since 2004 it has been mandatory for such clients to consider this form of arrangement when inviting tenders for public works.

Further information

History of Øresund Bridge. Available www.oresundsbron.com

Case Study 6: Office Renovation in Brussels

Background

Crown Building NV, a Brussels-based property company, wished to renovate an 8000m² office building (the Arcadia Building) and associated retail space in central Brussels, for occupation by the European Commission. This involved stripping the building back to its structure, and then reconstructing to a high standard. They wished to have a reliable estimate of the final cost at an early stage, and confidence that this would be achieved. Further, the work needed to be completed in the short timescale of 11 months and it was therefore necessary for all issues to be addressed through detailed planning before the site works commenced, in order that this timescale could be met. Crown Building established a partnering arrangement to achieve this.

The project

Crown Building initially appointed an architect (Jaspers) and a project manager (Probam). Probam then invited specialist technical contractors to contribute to the design process, and also involved the technical assessment organisation SECO. The team members were selected not only for their technical abilities but also because they were prepared to work in an open and constructive manner and to communicate well with other team members. The result was a design which could be approved by SECO and a budget based on estimates from the contractors that had been working on the project.

The general contractor for execution of the works (Willemen) was selected through a competitive process in which factors such as creativity, the proposed timescale, and quality standards, as well as price, were employed. They were paid of management fee for supervision of the specialist contractors. A 'guaranteed maximum price' was established with the general contractor with an agreement that any savings would be split, with two-thirds going to the contractor and one third to the client.

Measures taken to enhance teamwork were basic, but effective:

- The development of open communication channels which encouraged discussion of problems
- Regular team meetings that helped to create mutual commitment to the project
- Social gatherings to mark the achievement of key stages in the works
- Messages of thanks when key milestones targets were met.

Outcomes

The construction works were completed in August 2005 in less than 11 months, with a saving of 7-8% compared with the cost estimate. They achieved the quality standard required. The measures taken to encourage collaboration were considered to have produced a win-win environment in which everyone could benefit. The project manager was able to encourage the various team members to think creatively about the problems that needed to be addressed, and the team stimulated each other to propose solutions. But there were still some shortcomings in communications, owing to firms being unfamiliar with collaborative ways of working, and more attention would need to be paid in future projects to the creation of a genuinely open pattern of communications.

The process of developing the design under an independent project manager enabled there to be increased confidence in the cost estimate.

Further information

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Case Study 7: Linköping Hospital

Background

The University Hospital in Linköping is being redeveloped. The present hospital is spread over more than 50 buildings constructed from 1895, all of which need to be rebuilt or refurbished, with some demolition. The total cost of the project value is €110m; the project commenced in 2006 and will finish in 2011.

While there is an overall project partnering agreement, in reality it is closer to strategic partnering since the whole redevelopment consists of 70 different smaller projects. This provides an opportunity to benefit from the increasing experience of the teams involved and so to improve efficiency and reduce costs. The hospital, as client, has signed partnering agreements with two main contractors (NCC and a local contractor), four specialist services contractors and seven consultants for architectural and engineering services. These were selected using criteria based on experience and competence, proposals for the work involved, and price. The client was particularly keen to have highly experienced personnel on the project.

Aspects of partnering

Measures taken to promote the development of collaborative relationships and integration of teams in the design phase included:

- Locating all the staff concerned in the same building. This enabled problems to be solved through local communications, across the desks of the designers
- 'Partnering leaders' were recruited from a process improvement company with no experience of construction. These operated as facilitators and coaches. They arranged workshops but also operated as 'partnering controllers', monitoring the performance of teams and ensuring that they functioned well.
- a bonus system based on three assessment criteria was introduced. These were:
 - The degree of satisfaction of the end user when building was completed and occupied.
 - Adherence to the budget, which was set by the supplier
 - Adherence to the time schedule, also set by the supplier.

The maximum bonus was 2-2.5 %; there were additional bonuses for achievement of specific goals. The bonus system provided the financial incentives for good project performance; because of the number of individual projects, there was no overall target price.

It was found that a consequence of partnering was an increase in meetings and workshops, but they could be kept short and they helped to ensure that the project proceeded on schedule.

Outcomes and lessons learned

While the project is still in progress, the client estimates that they are currently achieving a cost saving of at least 10-15% and possibly more through the use of the same teams for the many different sub-projects.

However, every 3-6 months, team building has to be revitalised, otherwise there is the risk that the team falls back in to traditional, more antagonistic behaviour patterns.

A high rate of turnover of staff, particularly in the larger contractor, has caused some problems and implies that there needs to be adequate training and coaching in partnering skills.

Future intentions

Linköping Hospital will undoubtedly continue to use partnering for complex projects and has already started new partnering projects. Key issues in future projects include:

- Giving greater attention to identifying the individuals in consultants and contractors who show the greatest aptitude for working collaboratively.
- Using the partnering leaders(facilitators) to evaluate the skills developed by personnel in relation to collaboration and team work, and motivation
- Identifying team members that do not just focus on the present task but can come up with continuous improvements and alternative solutions that give the client lower costs and more value for money.

Further information

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Case Study 8: Baerum Municipality Model

Background

The municipality of Baerum, located near Oslo, has around 100,000 inhabitants. The Construction Client Department of the Council became dissatisfied with traditional forms of construction because they found that these often led to conflicts, time delays and cost overruns. Starting in 2002, therefore, they examined more collaborative procurement models. They wished the parties to their construction projects to have enhanced motivation and greater job satisfaction, and to develop a learning culture in which there would be a mutual desire for improvement and sharing of knowledge.

Having examined experience with partnering and similar collaborative arrangements, they saw the core values in the new process as openness, honesty, confidence, creativity and mutual respect among all members of the project team. The Department sought to reflect these values both in their bid evaluation processes and in subsequent project management.

The new arrangements were implemented on two small (€2–4m) projects. These were considered successful but the Department considered that the approach required developed for larger, more complex projects. With external advice, they developed their own model for collaboration, with particular focus on achieving predictability of the process and life cycle costs. This was introduced in 2006.

Features of the Baerum Model

The model assumes that the Department will contract with a consortium, not with individual firms. It has three main elements:

- 1) A template for the contract between the client and the consortium, based on the structure of the Norwegian standard design-build form of contract but with changes to emphasise openness, predictability and shared responsibility'
- 2) A statement of how the client wishes the consortium to operate
- 3) A template for the agreement that links members of the consortium

The model requires the members of the consortium to form an 'ANS', which is form of company in Norwegian law. The municipality is not allowed to create a formal alliance with that company, but the contract with the consortium seeks to establish the kind of collaboration that would result from an alliance. Thus, for example, Steering Group for each project has the managing directors of each of the participating companies as members with the client.

Features of the model include:

- a) Joint and several liability among the members of the consortium
- b) Risk carried as appropriate by the client and the consortium
- c) A 'open book' approach to finance
- d) Insurance cover for the consortium insurance, with specific cover for design faults taken out by design consultants
- e) All consortium members have the opportunity to earn a bonus, related to a target price which is an agreed estimate of the final cost. (it is not a guaranteed maximum price.)

In the selection process, consortia are invited to make proposals based on a general description of the project (function, space requirements, quality etc.). These are evaluated using criteria relating to: (i) the concept proposal (50%, the specific competence and reputation of the key individuals in the consortium (30%), and price data (20%).

The successful consortium then develops the project in close cooperation with the client. The Department aim in this phase is to establish an open and creative environment for design, in the belief that this will generate commitment across all parties to the project goals and that the problem solving will be enhanced.

To promote this, the team is encouraged to draw up a 'charter of intentions', which sets out their commitments on such matters as: collaboration, schedule, costs, the working environment, and architectural and construction quality. The client sets demanding goals for safety, environmental performance etc. At a later stage, a 'partnering agreement' is agreed by the members of the consortium. This stresses the equality of the team members; each of the members has an equal vote on issues. The agreement sets out their individual costs which together make up the target price.

Current position

Since 2006, Baerum Municipality has used the revised procedures in three projects of €22.3m, €40.7m and €42.9 m. None is yet completed but one will be completed in February 2009 and one in May 2009. Both client and supply-side members of the project teams, however, consider the new partnering model to be a success, pointing particularly to the way that they have encouraged early and intense collaborative activities in the project team. This is illustrated by the number of change orders; to date, none have been registered.

Future intentions

The Department intend to assess the model after completion of the third project in 2010. They wish to investigate aspects such as:

- The impact of the business cycle on the willingness of firms to enter into collaborative arrangements
- The characteristics of participating companies that particularly contribute to success
- The impact on construction quality and life cycle costs.

Further information

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Case Study 9: 'Consensus' non-profit housing

Background

Controls on rental levels in the social housing sector result in considerable pressure on initial costs. The 'Consensus' strategic partnership to produce non-profit housing arose from a view that collaboration across a number of comparable construction projects would lead to financial benefits for both client and the supply partners because the firms concerned would progress along a learning curve, resulting in better planning, fewer defects, less waste and greater flexibility. It was expected also that the same construction elements would be used in different products, leading to economics of scale.

The partnership

The partnership was formed by Lejerbo, a social housing provider, and NCC Construction Denmark A/S (contractor), COWI A/S (engineering consultant) and TR Andersen (architectural practice). The specific objectives were defined as:

- To develop strategic partnering as an instrument in long-term collaboration, both between client and the supply side and among supply-side interests
- To improve communications with the client and core supply partners and the ability to address project issues through early appointment of specialised contractors and other key member of the project team
- To develop and apply key performance indicators in order to monitor project performance under the strategic partnership and compare this with traditional practice

Projects

The Consensus partnership constructed two housing developments, both monitored by the Danish Benchmarking Centre for Construction. The first, 'Enghaven', consists of a three storey block of 34 apartments. These were originally planned as senior housing but during the project this was changed to apartments for assisted living and senior care. The design phase was initiated in January 2003, construction phase in August 2003 and the project was completed in September 2004.

The second project was 'Tvedvej', a development of 60 semi-detached two-storey family dwellings. Construction started in February 2005 and the project was completed June 2006.

In addition to the core members, some specialist suppliers and specialist contractors were included at an early stage in each of the projects as a 'second tier' partnering team. However, as a result of the growth in collaboration amongst core team members, these were appointed much earlier in the Tredvej project than in the first project. Consequently, in Tredvej they could inform the project process and suggest solutions to particular technical problems.

By comparison with projects constructed with traditional relationships, the client played a much more active role during the construction phase. The benefit to them was the ability to make late changes and, generally, to have much more influence on the final product. The performance indicators showed that client satisfaction, particularly for the second project, was high.

Outcomes

In both projects, because of the pressure on costs, significant savings needed to be found at a time of buoyant demand for construction. These were realised through collaboration within the strategic partnering group and with the specialist contractors. Thus the final cost of each project was lower than would have been the case under conventional arrangements.

Some additional savings were achieved in the second project, and these were shared under an agreement which formed part of the strategic partnership. However, because the two projects were different in character, there was little scope for transfer of technical details or

economics of scale. The lesson is that the full benefits of strategic partnering come from projects where there can be significant transfer of experience and purchasing ability.

The Consensus strategic partnership was dissolved after the second project, partly because there appeared no suitable developments for it to undertake but also because of changes of personnel in some of the partners. This underlines that the successful maintenance of such partnering does depend on their being project opportunities that are sufficiently similar to realise the advantages of the partnering approach, and that the role and commitment of individuals is of central importance.

Further information

Reports by the Benchmark Centre for the Danish Construction Sector, 2005 and 2008 (in Danish)

www.byggeevaluering.dk

Case Study 10: Management of Danish Main Roads

Background

The Danish Directorate of Roads manages 3800 km of main roads; these constitute around 5% of the total length of public roads in Denmark but the state-owned roads carry 45% of total road traffic. Starting in 2003, the Directorate entered into a number of partnering agreements connected to contracts for road management and maintenance. It did this for three principal reasons:

- to improve its dialogue with contractors and reduce conflicts
- to optimise the works that were carried out and encourage the development of new methods of management and maintenance
- to improve quality control and cost management.

The partnering agreements

The contracts covered by the agreements varied between €200k (for vegetation management) and €6m (for road and bridge management). They amounted in total to €20m annually. The measures that were taken to promote collaborative working included:

- joint development of shared goals and operational indicators
- team building activities such as seminars, workshops, etc.
- incentives for product and process optimisation including sharing financial savings between the contractor and the Roads Directorate
- formation of a management committee which actively promoted collaboration and was a forum for resolving disputes
- agreement that disputes would be solved by means of dialogue rather than arbitration or litigation
- regular evaluation both of results and of collaborative processes.

Outcomes

The partnering agreements were evaluated after three years. The evaluation showed overall cost savings in the three first years of 3%, 6% and 4.5% respectively, with savings of as much as 25% in individual items of work. The calculations which supported these savings estimates were detailed and comprehensive. They included, for example, the value to road users of fewer delays owing to better planning of maintenance works; the value of better safety management for maintenance workers; savings owing to reduced labour requirements and reduced costs because of better quality maintenance works.

More generally, the benefits of the collaborative measures included the development of optimised process that the Roads Directorate could include in future invitations to tender with the consequence of lower costs in future.

Contractors benefited from improved competitiveness owing to better work process planning, more efficient administrative processes and direct financial reward for good performance through the sharing of savings. Moreover, the longer term relationship encouraged innovation, such as the development of new equipment for cleaning reflector posts which reduced labour costs substantially.

Lessons learned

The partners found that it was difficult to maintain momentum throughout the process of changing working practices partly because it is always easier to continue "business as usual", and partly because a more collaborative approach appears, at least initially, to be more time-consuming than traditional ways of working. The top managements in both the Directorate and the contractors played a decisive role in maintaining commitment throughout, but effective implementation depended on the personnel actually working on the roads and they needed to be actively involved in partnering activities such as seminars, workshops etc.

Future intentions

The Roads Directorate and the three contractors have agreed to continue to work in a collaborative manner. These particular contracts cannot be prolonged for more than a maximum of seven years but the knowledge gained from the partnering agreements will be applied by the Road Directorate in future invitations to tender and consequently in contracts and agreements. Generally, it is the opinion of the Road Directorate⁷ that:

- partnering has been a positive experience
- it requires a dedicated effort from both parties in order to achieve success
- while trust and openness are required, close monitoring and if necessary critical appraisals are also needed
- the development of new forms of collaborative working will continue.

Further information

www.vejdirektoratet.dk (in Danish)

⁷ Tarp (2006) Partnering in the Road Directorate's maintenance and construction works. Presentation at SBI, 4 December 2006

Case Study 11: Birmingham Construction Partnership

Background

Birmingham City Council serves a population of approximately 993,000. Its capital expenditure over the period 2006-2009 for schools, roads, housing, leisure facilities and regeneration will be some €1.1 billion. Birmingham Construction Partnership (BCP) is a framework arrangement established by the Council in 2004 with three main contractor partners. Subsequently, around 60 other firms in their supply chains have been brought into the framework. These are mostly SMEs, with annual turnovers from €400k upwards. The framework has a life of five years, extendable to seven years. BCP was originally envisaged expected to handle some €450m value of work but this figure is now expected to be over €700m.

Framework Objectives and processes

BCP set out to maximise opportunities for SMEs through identifying suitable firms in the main partners' supply chains. This was consistent with the City Council's policy of encouraging local employment. The Partnership has also sought to enhance skills in its members.

Following the appointment of the main partners, BCP identified the trades where there was prospect of reasonable continuity of work and then selected firms within those trades for inclusion in the framework. These included electrical and mechanical trades, landscaping, window manufacture and installation and roofing. The number and type of firms selected depended upon the estimated workload; the Council did not wish it work to account for more than 30% of any individual firm's turnover.

The firms were appointed by May 2006. Initially, each was offered work according to its overall suitability (based on skills, experience, capacity and location) but progressively work will be allocated according to performance as measured through agreed indicators. The performance of the main contractor partners will also be measured by these indicators.

SME Training and Skills Accreditation

The Partnership has promoted training events for the supply chain firms on such subjects as open-book accounting works and new regulations and encourages the firms to be accredited to national performance standards, which include skills specific to working in a framework structure. Apprentice training is also encouraged with financial support being available.

Outcomes

A study of the Council's previous use of SMEs showed that, while some 980 firms were on its list of 'approved contractors' only around 60 firms were regularly employed. Thus the introduction of the framework did not seem to have reduced opportunities for SMEs overall but some firms had gained through being included in the framework while others had lost opportunities.

The introduction of uniform accounting principles raised difficulties; the main BCP partners had agreed to common levels of profit and overheads but the smaller firms had a range of methods for cost allocation. Work is in hand to address this issue.

Formal studies have yet to be carried out, but the wider benefits of the framework include the positive impact on the local economy and employment, and the development of better communications across supply firms assists the introduction of sustainable technologies and products into the construction works

Further information:

www.birmingham.gov.uk

Case Study 12: National Health Service facilities: Procure21

Background

ProCure21 is a procurement method developed by the UK Department of Health for the provision of mid-range of National Health Service (NHS) facilities such as primary health care centres, community hospitals and new facilities in existing hospitals. The schemes that have been constructed through the Procure 21 process range in size from less than €1m to around €90m.

Under Procure21, a procurement process conducted centrally by the Department, and fully in accordance with EU procurement requirements, resulted in the selection of 12 consortia which were included in a Framework Agreement for the provision of health service facilities. This agreement initially operated for two years from 2006 to 2008, but has now been extended to September 2010.

Each consortium consists of a 'Principal Supply Chain Partner' (a main contractor) together with architectural and engineering design consultants and other relevant (eg cost) consultancies.

This arrangement means that the consortia are pre-qualified to undertake works for local NHS Health Trusts, who are the clients for the health facilities. The Trusts are able to select the most appropriate consortium for their specific project through a simplified selection process which does not require advertisement in the OJEU. Trusts are able to select their preferred PSCP and associated consortium in three to four weeks, saving at least six months in tendering time.

Collaborative aspects

Several aspects of Procure21 encourage collaboration:

- Selection of consortia, rather than of individual firms, encourages firms to develop collaborative ways of working – within the consortium and with the client – and to improve these over a number of projects. Initial selection for the Procure 21 framework did not provide any guarantee of work but in practice the great majority of Trusts with more than one scheme have used the same consortium for all their schemes. Thus the prospect of obtaining further work provides a strong incentive for collaboration.
- The form of contract used in Procure21 (NEC Contract Option C) encourages early warning of project issues and collaborative problem-solving.
- A Guaranteed Maximum Price is agreed, and savings are shared. Open book accounting is employed.

Other features of the system which promote the successful delivery of projects include:

- Bringing in all the principal members of the supply team at an early stage. This facilitates detailed planning and leads to time savings in site works, typically seven weeks for schemes of £1–5 million and 17 weeks for schemes of £5–15 million.
- Having a register of accredited Project Directors which can be called upon by the Trusts
- Making available design quality and risk management tools.

Outcomes

Procure21 has enabled NHS health trusts to deliver projects significantly more effectively than previously. In 2006, it was reported that 132 Trusts were using the system to deliver 265 projects with a total value of some €3 billion. 94% of completed schemes had been delivered on budget and 89% were delivered on time. Clients rated their satisfaction with both the final product and the service that they had received very highly and quality standards also exceeded national norms.

Further information
www.nhs-procure21.gov.uk

Case Study 13: Hillingdon Homes Ltd

Background

Hillingdon Homes Ltd is a publicly owned company responsible for the management of 10,600 dwellings owned by the London Borough of Hillingdon, a local authority in west London. In 2004, it established a framework arrangement for small works which was orientated towards small local contractors, complementing existing frameworks for replacement of bathrooms, kitchens, etc with larger contractors from outside Hillingdon. The framework covered improvements to 650 properties in several locations.

The framework was initially tendered for two years with planned investment of £1.5m (€2.0m) in the first year and a further £1.8m (€2.4m) in the second. Individual project costs varied from €750 to €80k. Three SME contractors were appointed; two had annual turnovers of around €4.5m, the other was much smaller. After the initial two years, new contracts were negotiated for a further two years ending in March 2008. The success of the arrangement led to the framework covering a wider range of work, including bigger projects.

SME orientation of the Framework

Aspects of the framework process that promoted participation by SMEs and supported their subsequent development included:

Consultation: Open Days were held to explain Hillingdon Homes' proposals and to obtain feedback from prospective tenderers.

Tender Process Support: Training days were arranged, to assist contractors to complete the formal tender documentation.

Simplified Accreditation: All the firms short-listed for the framework had previously carried out work for Hillingdon Homes; because of their satisfactory performance, they were not asked to undergo any further technical assessment.

Skills Gap Identification and Training: None of the appointed contractors had any previous experience of working in a framework. Hillingdon Homes, with assistance from outside consultants, applied a process-mapping tool to identify gaps and problems in their systems and capabilities.

Framework Management Arrangements

These were made as simple as possible and Hillingdon Homes adapted its processes to fit in with the systems the contractors already had in place, rather than impose new systems upon them. Technical documentation was simplified and with growing trust, works orders could be placed by telephone with subsequent written confirmation, shortening lead times. Key performance standards were laid down in terms of outcomes. Accounting transparency was achieved through open-book accounting.

A 'management forum' was held monthly. The initial concept was that this meeting would review performance, address problems, plan the delivery of the programme and address training needs. However, it grew to be a forum for much broader collaboration, with experience being shared on technical problems, suppliers, sub-contractors and reporting obligations. In a spirit of friendly competitive rivalry, the contractors assisted each other. The result was better communication, sharing of responsibilities, and enhanced commitment, accompanied by mutual support, trust and respect.

Outcomes

The framework was considered successful, with SMEs contractors responding to the challenges of collaborative working, resulting in sustained improvement in productivity, customer awareness and liaison, and in contractors' management processes. Cost savings of up to 25% were obtained. Wider benefits included:

Local economy

All the framework contractors were based in Hillingdon. They employed local workers and sub-contractors on the projects. Hence much of the money spent through the framework was recycled through the local economy.

Service Delivery

Quality increased significantly, with firms concentrating on 'right first time'. Customer satisfaction levels rose significantly.

Welfare

The cost of safety measures was built into estimated project costs and under the open book accounting approach, and there was no longer any incentive to cut these costs.

Sustainability

Through the use of local firms, travel distances were reduced. The framework also raised awareness of waste, which was reduced across the programme.

Further information

www.hillingdon.gov.uk

Case Study 14: Rail construction - Waardse Alliance

Background

A new freight rail link, the Betuweroute, has been constructed from the German border to the port of Rotterdam – 160km in total. After ten years of construction, the works were completed in June 2007. Around 22km of the line was constructed through the Waardse Alliance, the first example of a project alliance for civil engineering works in the Netherlands

The Government-owned company ProRail BV is responsible for developing railway infrastructure in the Netherlands. Within ProRail, PoBr (Project Organisation Betuweroute) was responsible for developing the Betuweroute and acted as client on behalf of the Ministry of Transport, Public Works and Water Management

The Alliance

The Waardse Alliance was a collaboration between PoBr and HBSC, a consortium of contractors (Heijmans, Bos Kalis, and Strukton from the Netherlands and CFE from Belgium). Originally, it was intended that the project works would be undertaken through a Design and Construct contract between ProRail and HBSC but after award of that contract this was converted into an alliance contract for the design and supervision of the works and a separate construction contract between ProRail and HBSC. A joint Board, with representatives from both PoBr and HBSC, was created and a joint organisation for undertaking the design and associated tasks: managing environmental impacts, supervising the contractor and checking the construction, and managing the finances of the project.

The adoption of an alliance structure was intended to encourage collaboration and facilitate sharing of risks, resulting in a more successful project. It was an advantage that the parties involved in the consortium had already come to agreements over the sharing of profit and risks.

Tasks were allocated to individual organisations in the Alliance through collective discussion. The partners thus took collective responsibility for the outcome and the management of associated risks. However, certain risks that could only be managed and/or influenced by a single party were not shared and some were retained by PoBr on behalf of the Ministry. Thus, for example, the Ministry carried the risks for major delays caused by failure to be granted the necessary permissions for works.

Extra costs, or savings, achieved in the course of the project were divided equally between ProRail and its partners in the Alliance.

Dispute resolution procedures

The parties to the Alliance aimed to resolve any problems through 'working level' discussions. A Board of Experts was established to advise on any disputes. Its recommendations were not binding and so the parties needed jointly to consider its recommendations. While this could lead to slower settlement of disputes, it was thought that this would improve collaboration, because the parties would decide collectively whether or not to follow the recommendation.

Only if these processes were not successful would the issue be considered a formal dispute and in that case the Alliance Board was required to find a negotiated solution. If no agreement were possible, the parties could appeal to the Netherlands Arbitration Institute but this was never required.

Ownership of intellectual property

In order to encourage collective development of innovative proposals for addressing the many challenges of the project, the Waardse Alliance contract did not permit the contracting parties to claim individual intellectual property rights related to work carried out in the project.

Outcomes

A study of the Alliance showed that patterns of communication within the Alliance differed considerably from those in conventional projects. There was a much higher degree of direct 'horizontal' communication with appropriate individuals, rather than indirect communication through the project manager or contractor. This was evidence of the integrated working that the Alliance was designed to produce.

The project was delivered on time and to budget, with better financial outcomes for the various parties to the Alliance. Those concerned considered that the collaborative arrangements had contributed significantly to its success and as a result, similar arrangements have been used in subsequent infrastructure projects in the Netherlands.

Further information

www.kennis.betuwerooute.nl (in Dutch)

Case Study 15: North West Gas Alliance

Introduction

In the UK millions of km of old gas mains needs replacing to assure public safety. In the North West of England around 2bn km of gas pipes are due to be replaced in a programme extending over 30 years. The pipes are owned by National Grid which has formed an Alliance with the Balfour Beatty Group to undertake the current phase of the replacement programme.

The North West Gas Alliance was created in 2004, following award of a contract from National Grid to Balfour Beatty for a period of eight years, extendable to 13 years. The alliance – the principles of which are set out in an over-arching Agreement - was created to meet a range of objectives:

- To provide a structure in which there could be a single focus on the requirements of the programme
- To provide much higher throughput than would be available through conventional contracting processes
- To bring about culture change in the planning and carrying out of the works, with personnel recognising wider aspects of their activities and communicating more effectively across the team
- To respond to concerns and pressures over safety and over communication with local communities and others affected by the programme.

Features of the Alliance

The alliance has a Supervisory Board with two representatives from each party. Below the Board, the management and operational structures are fully integrated. Although the personnel involved continue to be employed by National Grid or Balfour Beatty, they work as the Alliance team.

Each year, a programme of works is agreed, with target costs. Savings and cost overruns are shared. Risks are closely examined and responsibilities allocated. Some risks, which cannot be managed by the Alliance, are retained by the client.

Performance is monitored against a set of indicators, which include not just costs but also safety, customer service, staff turnover, investment in training, etc.

Outcomes

The Alliance has recorded significant performance improvements since its creation:

- It is now replacing over 500km of mains annually, compared with around 150km before the Alliance commenced operations
- The safety performance has improved from around the industry norm to a recent period when over 4 million man-hours were recorded without a significant accident
- Costs have been reduced by around 15% in real terms.

In addition, many features of the Alliance have been applied to relationships between Balfour Beatty and its sub-contractors and suppliers, providing them with a financial framework in which they too can embrace the Alliance objectives and values, increase investment in safety, training etc. and share in the benefits of improving the performance.

Further information

www.nwgasalliance.co.uk

Case Study 16: Finnish pre-cast concrete construction consortium

Background

Three companies, from different sectors of construction, decided to conduct a joint study of their business processes and production process in order to be able to work more effectively together. They aimed significantly to improve quality, efficiency and safety. The study was published in 2003 and led to the firms establishing longer-term relationships.

The firms concerned were

- YIT Construction Ltd (contractor)
- Parma Oy, a company within the Consolis group (manufacturer of concrete products)
- A-Insinöörit Oy (design office)

The initial study

At the beginning of the study, project and site planning and control processes were modelled and views on development needs were collected. After considerable joint effort (including monitoring an actual construction project), a new process model for inter-company activity was generated. The key changes were:

- (1) The conventional procurement process of 'invitation to tender' followed by tendering/bargaining/placing of order was replaced by negotiations over what was to be supplied, with price etc settled previously;
- (2) Any project, the early stages of design would be carried out through cooperation across the parties so that decision-making could be expedited;
- (3) The conditions necessary for effective design, production and safe construction would be secured by joint reviews;
- (4) Errors would be used systematically as a source of learning with good, universal solutions to problem areas developed together;
- (5) Information management and co-operation would be improved through the use of mutually agreed procedures;
- (6) Safety management procedures would be integrated into production planning.

Outcomes

In the view of the participants (as recorded in the study report), the study improved co-operation between companies, clarified the significance of project stages to the parties and deepened understanding about the interdependencies and effects of activities. The study led to a 'partnering' agreement covering the three firms, with the aim of implementing the new processes in future projects.

Because of the new practices, the pre-cast concrete supplier could give the contractor an almost firm price relatively early in the process, since the supplier's expertise was available throughout the process, both at the early design stage when the aim was to arrive at an economically efficient solution as well as later in the process when cost increases owing to design modifications could easily arise. Therefore, the contractor could see a major benefit in terms of cost predictability and savings.

The pre-cast supplier benefited in a different way. Having a steady flow of work was important for them since the seasonal fluctuation in demand for construction products is a particular challenge to manufacturers in Finland. Continuous discussion with the contractor and early

involvement in each project gave them more scope for anticipating demand and planning their production. The co-operation resulted in structural innovations also.

The present position

The contractor and the manufacturer continue to have a kind of 'partnering' relationship, particularly focussed on housing development at a former industrial site at Tampere, although they have not been able to maintain all the processes that came from the study. The design office involved does not consider that they are in the same sort of partnering relationship but do co-operate with other parties and benefit from having a more continuous flow of work. The relationships do not extend to having agreements on financial issues - shared savings etc - but the parties see other benefits in the continuing relationship.

Reference

Teriö, O., Koski, H., Rantanen, E. & Ruuhilehto, K. (2003) Process re-engineering in pre-cast construction. VTT Research Notes 2222, Technical Research Centre of Finland (VTT), Espoo. (in Finnish) <http://www.vtt.fi/inf/pdf/tiedotteet/2003/T2222.pdf>

Case Study 17: EspritHuis

Background

The EspritHuis Association is a consortium of suppliers to the Dutch housing sector formed to develop and promote consumer-orientated housing based on 'mass-customisation' principles similar to those employed in motor manufacturing. In mass-customisation, a standard design is modified through the addition of many complementary components to provide a final product that meets the requirements of the individual purchaser.

The Association was founded in 1985 by a design consultancy and a property developer and a demonstration project was accomplished in 1991. However, it has taken a number of years to persuade suppliers and the construction industry of the merits of this approach. Suppliers tend to focus on the cost of components rather than how the process can be progressively improved by the introduction of these concepts.

Some 30 firms are currently members of the Association. These include property developers, contractors, designers and suppliers of building components such as doors and windows, heating systems, sanitary systems, roofing etc. Some are international (eg Lafarge, Geberit) while others operate in local Dutch markets only.

Product of the consortium

Through collaboration among these various interests, basic housing designs (known as 'platforms') and a set of priced 'options packages' have been developed. The prospective purchaser of the house decides upon the platform and then selects options from the range of packages using a Web-based program. These decisions are then directly communicated to the suppliers so that manufacture and supply can be scheduled.

Each party benefits from the EspritHuis approach:

- *Purchasers* benefit from manufacturing efficiency and lower prices (less than €200,000 for a house). They are also able to create a 'personalised' house at a price which is fully determined prior to construction. Some option choices can be made relatively late in the construction process.
- *Component suppliers* do not have to provide purchasers with individual quotations for their products. They participate fully in the development of the options packages and are able to introduce innovations as part of the process of developing the package.
- *Contractors* are able to become familiar with the options before construction and can have confidence in their ability to include them, at an appropriate price. For smaller contractors, in particular, this reduces the risks of including new product developments.
- *Designers* are able to develop designs which reflect modern requirements, and are part of a coherent design philosophy. Their designs are not constrained by the need to fit into older dwellings.

Boekelo project

EspritHuis initiated its first full-scale residential project in 2005. This project, at Boekelo, is being developed through a design-build (*bouwteam*) organisation and will involve the construction of 40 dwellings. The objective is to create and demonstrate a more efficient design and construction process with a range of optional, priced packages from which clients could choose. The options include:

- Different floor plans (eg varying the number of bedrooms or adding a porch)

- Alternative heating systems (heat pumps, underfloor heating etc)
- Changes to doors, windows etc
- Additional electrical facilities

Construction of the Boekelo houses has not yet started owing to uncertainties in the Dutch housing market but will commence when there is evidence of a renewed market for housing.

Further information:

www.esprithuis.nl (in Dutch)

Case Study 18: Arcona

Introduction

Arcona is a property development and construction company based in Stockholm. Founded in 1985, its current turnover is 600M SEK. Since the early 1990s, Arcona's business model has been established on the principle of developing strategic relationships with selected partners in order to be able to offer clients a complete construction service. The partners (now seven in number) cover a wide range of expertise:

- Architectural design services
- Building services design and installation: heating, ventilation, electrical, fire safety etc
- Structural design and construction
- Provision of construction plant

Arcona has developed a partnering relationship with each firm, based on customer focus, openness and teamwork and supported by economic incentives including sharing the financial benefits obtained by improved design, site practices etc. Thus contracts with the partners are based on a target price, with agreed sharing of additional costs or savings. Arcona develops similar relationships with its clients which include both public authorities (eg Stockholm City) and private firms (eg Scania).

A 'co-operation agreement', covering Arcona and all the strategic partners, sets out the essential features of the relationship. Based on forms of contract which have been developed in Sweden to encourage collaboration, it places a mutual responsibility on all the members of the consortium to seek the best outcome from a project and to create maximum customer benefit. The agreement is not exclusive – ie the partner firms are able to work with other contractors and Arcona is able to work with other suppliers (although it rarely does so).

Benefits of collaboration

Arcona and its partners seek progressively to develop their collaboration, through workshops, regular examinations of performance etc, in order to improve teamworking, create stable processes and achieve continuous improvement. The collaboration enables them to share and build on experience and assists their aims of:

- Making permanent improvements in processes through reducing and hopefully eliminating wasteful activities
- Avoiding disruption in projects, by coordinating design, off-site production and site works

Through the collaboration, Arcona and its clients achieve:

- A firmer basis for cost estimates, particularly at the early stage of a project, which is valuable for guiding investment decisions
- Shorter and more assured delivery times
- Higher quality, leading to Arcona being able to offer extended warranty periods and give greater confidence in operational cost factors such as energy consumption

For its partners, the advantages include:

- Early information about projects and the ability to contribute to them from the start
- Greater security in workload and the ability to plan effectively
- Sharing of information on processes, technologies etc
- Enhanced ability to implement continuous improvement, informed by the experience of all partners
- Increased understanding of customer requirements.

Further information

www.arcona.se

Case Study 19: CIPEA

CIPEA stands for Consorzio di Imprese di Produzione Edili ed Affini (Consortium of Construction and Building Companies). CIPEA was created in 1980 by several building and road construction companies in Bologna and the surrounding region who wished to collaborate in bidding for and undertaking construction works. Since then, the consortium has grown and CIPEA now has over 700 member companies employing over 6,000 workers. Most are located in the region of Bologna but CIPEA has members in all parts of Italy. In 2007, CIPEA secured more than €110 million of contracts.

The members of CIPEA cover a wide range of specialist skills and as a consequence CIPEA can offer many services to public and private sector clients including:

- Construction of new residential and industrial buildings
- Refurbishment
- Design and installation of building services
- Scheduled and emergency property maintenance
- Maintenance and renovation of historic buildings
- Road construction

CIPEA is also able to arrange project financing.

When a request for tender is received, CIPEA agrees with appropriate member firms the contribution that each should make to the overall project and then prepares a tender in the name of CIPEA. Its member firms also seek compete for work as individual firms, but generally for smaller works than the public contracts which are the main focus of the collaborative tendering through CIPEA.

CIPEA places great emphasis on quality and promotes this in member firms through:

- Seeking accreditation for a Quality Management System in compliance with UNI EN ISO 9001:2000
- Monitoring the work carried out by member companies
- Defining standardised working methods, and improving networking and sharing of information
- Helping members to avoid errors, and thus reduce costs
- Guaranteeing that members fulfil contractual requirements, so that clients receive complete satisfaction.
- Promoting a quality image for the Consortium.

Further information
www.cipea.it

Case Study 20: French Federation of Building Cooperatives

Introduction

The FFACB (*Fédération Française des Artisans Coopérateurs du Bâtiment*) is a national federation which represents and supports local cooperatives of small building firms which are principally concerned with the construction, extension and renovation of single-family houses. The Federation is the outcome of successive amalgamations of bodies with similar objectives over the past 20 years.

In 2007, FFACB had 130 cooperative members, from across France. These in turn had a total of 2800 firms in membership, with 6500 employees. The individual cooperatives vary in size, from those that construct only a few houses annually to those that construct several hundred. In total, they built 1356 houses in 2007 and the total turnover of member firms was around €230m.

Within each cooperative, firms retain their independence but take advantage of joint marketing undertaken by the cooperative and share the profits of the cooperative in accordance with the share of its work that each firm carried out. Firms can enter and withdraw from the cooperative freely. Each member has equal access to the cooperative's services and a single vote when decisions are required. Each member is also expected to contribute to the management of the cooperative.

The Federation's services include:

- Keeping its members informed on technical and other (eg legal, fiscal) developments
- Facilitating exchange of experience amongst its members
- Providing advice on measures that will help to the develop and maintain cooperative behaviour
- Advising and assisting small firms and individual craftsmen who wish to come together in a cooperative on the requirements and processes for creating such a mutual body
- Supporting the competitive position of members through the provision of quality schemes, warranty arrangements, management advice, etc
- Organising training courses
- Promoting the quality and the reputation of cooperatives.

Benefits from working together

The FFACB see the following benefits from firms coming together in cooperatives:

- Expansion of market opportunities
- Creation of more effective teams, leading to productivity gains and reduced project timescales
- Opportunities for sharing experience and arranging joint development activities
- Firms gain from the higher market profile that the cooperative can create, while keeping their own independence.

There are also some tax benefits.

Further information

www.ffacb.com

Case Study 21: Pre-project 'clinic'

Background

The Finnish Association of Building Owners and Construction Clients (Rakli) has developed the concept of a "procurement clinic" which can assist the development of optimum solutions to project challenges. The clinic brings together different construction interests in a cooperative information exchange activity. A construction client who has a demanding project which has issues potentially of relevance to other projects may suggest that the project be addressed with the aid of a 'clinic'. If this suggestion is accepted, Rakli will bring together 10–15 experts from organisations representing different supply interests and consultants to consider the challenges of the project in a series of workshops, normally about 5 in total. The aim is to find optimal solutions and to ensure that all relevant factors are identified prior to launching the actual procurement process.

Ring Rail Line

The first application of the clinic concept concerned the Ring Rail Line – the proposed rail connection to Vantaa and to Helsinki-Vantaa Airport.⁸ This is a demanding project involving 18 km of track of which more than 8 km will be in tunnel, together with numerous stations, road realignments, etc.⁹ The Finnish Rail Administration (RHK) is the client for the line but the City of Vantaa is also a significant stakeholder since the line will be located in Vantaa.

Through the clinic, RHK conducted a dialogue over implementation of the project with key industry representatives. There were 15 participants, together with a facilitator and two *rapporteurs* from Rakli. This was rather more than would normally take part, and reflected the number of interests in the project.

The objective was to come up with an approach to procurement that would produce the desired result at an appropriate cost. Amongst the subjects considered in the clinic were:

- ways in which the project might be split into sub-projects, and the use of different procurement approaches and project delivery systems for different parts of the overall project
- achieving optimal phasing through considering the interactions and dependencies amongst the various project components
- appropriate structures for risk transfer
- the market situation and critical resources.

Since the clinic took place prior to commencement of the procurement process, it was not appropriate to discuss financial matters or detailed contractual obligations.

Outcome

The clinic was judged a success. RHK benefited from the knowledge and expertise of the senior industry representatives while they in turn were informed about the client's intentions for the project.

A second clinic, concerned with major refurbishment of hospital buildings has since been conducted. Others are planned.

Further information

www.rakli.fi

⁸ Vaara, P. (2007) Procurement clinic for the Ring Rail Line, Final report. Rakli, Helsinki. (in Finnish) <http://www.rakli.fi/kehitysjaprojektit/projektit/hankintaklinikka/>

⁹ <http://www.keharata.net/english/contacts/htm>